

---

# GCM

Gary - Chicago - Milwaukee ITS Priority Corridor

## Corridor Transportation Information Center

---

Release 1.0  
System Integration Test Report  
Document # 9937a.01

---

PROPRIETARY AND  
CONFIDENTIAL

Prepared by: De Leuw, Cather & Company

Issue Date: May 23, 1996

GCM Corridor Transportation Information Center

May 23, 1996

**GARY-CHICAGO-MILWAUKEE CORRIDOR  
CORRIDOR TRANSPORTATION INFORMATION CENTER  
SYSTEM INTEGRATION TEST REPORT DOCUMENT**

**TABLE OF CONTENTS**

1 INTRODUCTION ..... 1-1  
1.1 PURPOSE ..... 1-1  
    1.1.1 Goals of this Document ..... 1-1  
    1.1.2 Intended Audience ..... 1-1  
    1.1.3 Document Organization ..... 1-1  
1.2 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS ..... 1-1  
1.3 REFERENCES ..... 1-1

2 C-TIC SYSTEM INTEGRATION TEST SUMMARY ..... 2-1

3 C-TIC SYSTEM TEST RESULTS ..... 3-1

**GARY-CHICAGO-MILWAUKEE CORRIDOR  
CORRIDOR TRANSPORTATION INFORMATION CENTER  
SYSTEM INTEGRATION TEST PLAN DOCUMENT**

## **1 INTRODUCTION**

### **1.1 PURPOSE**

The purpose of this report is to present the findings of the System Integration Test Team which relates to the compliance with the C-TIC Release 1.0 requirements. This report summarizes the tests performed, the procedures and any comments related to the outcome of testing. Testing was performed Monday through Friday during regular working hours, or when most convenient for the system, during the three week period from March 28, 1996 through April 18, 1996.

#### **1.1.1 Goals of this Document**

The **System Integration Test Report** has the goal of providing documentation of the test results and to verify which Release 1.0 requirements were met. Deficiency reports were written and submitted on those that were not met and scheduled to be corrected in a timely fashion.

#### **1.1.2 Intended Audience**

The **System Integration Test Report** is intended for the integration test team and also for the key designers. The test team consists of Dave Weiss (team leader), Mark Golucki and Cary Solberg of De Leuw, Cather & Company; Chris Lain, John Dillenburg and Doug Rorem of UIC - EECS; and Jeff Hochmuth of IDOT. It is also intended for others that are undertaking similar ITS project activities in the future.

#### **1.1.3 Document Organization**

The document is organized as follows: Section 1 contains an introduction and goals of this document. Section 2 summarizes the system test results and notes deficiencies found. Section 3 details each step of the test and specific results.

## **1.2 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS**

The **System Glossary Document**, contains all definitions, acronyms, and abbreviations associated with this project. It also contains information relating to ITS, communications, and other related standards.

## **1.3 REFERENCES**

Documents to be used as references include:

C-TIC System Definition Document #9931.02 dated February 2, 1996.  
C-TIC Interface Control Specification Document #9932.01 dated August 9, 1995.  
C-TIC System Glossary Document #9936.02 dated November 1, 1995.  
C-TIC Requirements Specification Document #9933.03 dated February 9, 1996.  
C-TIC System Integration Test Plan #9937.01 dated April 19, 1996.

The **System Definition Document** identifies the top level processes, data flows, and system controls for the

Gary-Chicago-Milwaukee (GCM) Corridor Transportation Information Center (C-TIC.) The **Requirements Specification** establishes the requirements on the system defined in the System Definition Document. These requirements are testable statements of system and subsystem functions. The **System Integration Test Plan** document is the test plan for C-TIC system integration testing. This **System Integration Test Report** documents the results and findings from implementing/executing the Test Plan.

## 2 C-TIC SYSTEM INTEGRATION TEST SUMMARY

### Introduction

The C-TIC System Integration Test Summary is designed to give a summary of the findings of the System Integration Test Team which relates to compliance testing with the C-TIC Release 1.0 requirements. This section summarizes the tests performed and any comments related to the outcome of testing. Testing was performed Monday through Friday during regular working hours or when most convenient for the system during the three week period from March 28, 1996 through April 18, 1996.

### General Requirements

This section covers the basic components and data storage. Testing was done by reviewing the Release 1.0 System Integration Test Plan Document #9937.01 and checking to insure that all required features were operational and that they met the requirements.

There were no problems encountered with data storage or memory with the C-TIC.

One component that has been addressed and has been corrected, is the UPS integration software. The integration software's responsibility is to warn the system when the power is close to being drawn out completely (within ten minutes), and then shut down all processes in a systematic, recoverable fashion. When this component was tested during a simulated power failure, no indication was given to the C-TIC that the power in the UPS was running low and to initiate process shut down. The C-TIC simply shut down completely when the power ran out. A new updated version of the UPS integration software has since been installed on the C-TIC and will be tested with the Release 2.0 requirements.

Another part of the operating system that needed attention was standard report and disk usage report generation. The generation of the standard reports were to be both automatic and operator driven to either a file or a printer. The disk usage report was to be generated either to a printer or terminal screen. At the time of testing these requirements, the standard reports were not operator driven and the disk usage report only printed to the printer. These deficiencies have since been corrected.

### Corridor Map Requirements

The corridor map requirements were tested by opening the corridor map and verifying proper operation of all Release 1.0 requirements related to the corridor map.

The C-TIC corridor map does not allow for anecdotal input until Release 2.0. There were several menu items that did provide for anecdotal input and if used, would freeze the system. These menu items included: "input incident/closure", "monitor NWCD input" and "monitor incidents". Also, in the "input map properties" menu, options for probe reports had not been removed. These menu items have since been disabled on the corridor map.

During testing it was found that the "Select" and "Locate" segment ID menu items did not work for some of the segment ID's on the corridor map. These deficiencies have since been rectified.

Two other deficiencies relating to the Corridor Map consist of displaying road names and the ability to scroll the map in a smooth manner. The "Display Road Names" function does not label the expressways in acceptable positions (i.e., in the middle of the expressway link) on the corridor map and is scheduled to be

corrected for Release 2.0. The scrolling of the map has been addressed and this deficiency is closed.

#### Internet and other External Interface Connections Requirements

There were only a few problems with external interfaces to the C-TIC. One related to the SSI weather process. The C-TIC was not receiving any weather reports. This was due to a bad connection at SSI and not the C-TIC. This deficiency has been remedied and the connection has been reestablished.

The TSCDRV process, when tested by clearing errors, remained in an unstable state. The process was not able to handle operator requests and incoming data from the TSC simultaneously. The operator requests were interrupting the incoming data which caused the process to be unstable. This process will be recoded by EECS for Release 2.0 at which point this deficiency will be addressed. Restarting the process has remedied the situation for the short-term.

On the condensed version of the congestion map there was no expressway name for the Kennedy Expressway to click on to obtain the travel times for that particular roadway. This minor problem has been resolved.

#### GUI Environment Requirements

The system testing that was performed on the Graphical User Interface encountered only one deficiency. When the operator selects a function that takes a few seconds to complete, the system does not, in some instances, provide a signal to the operator that it is in the process of executing that command. In other instances the mouse arrow turns into a timewatch which signals the operator that the system is busy performing the desired function. When this does not happen, it is easy for the operator to continue clicking on a function not knowing if the system is actually performing it or not. This deficiency has been addressed and corrected.

#### Backups/Archiving and Database Requirements

Concerns about the off-the-shelf archive utility, Legato, were raised during the database testing. Based on all available documentation, the Legato software has all the capabilities needed to meet the requirements, it is now a matter of becoming familiar with the Legato manuals to actually incorporate the procedures into the C-TIC operator's routine. Steps have been taken to insure that the procedures for backup/archiving are included in the C-TIC Users Manual for on-line help.

All other backup/archiving and database requirements were satisfied.

#### Miscellaneous Requirements

A thirty-day test was run between April 19, 1996 and May 19, 1996. The purpose of this test was to ensure that the C-TIC was operating for at least 99% of the available run time. The results of this test were based on the C-TIC Operations Reports during the thirty-day testing period. The C-TIC Operations Report, which are generated daily at the C-TIC, document which processes had been shut down during the past twenty-four hours. After compiling the data for the thirty-day test, the C-TIC proved to be available for at least 99% of the available run time. All other requirements not specifically related to any of the above headings were met.

#### Summary

Through intensive testing and cooperation with EECS, De Leuw, Cather performed all necessary analyses

on the requirements for the C-TIC Release 1.0 features. All testing was accomplished and the system operated in an acceptable manner except as previously noted. Instances where the results were considered deficient were addressed and quickly corrected or are in the process of being corrected. Outstanding deficiencies are as follows:

- Displaying road names (to be corrected for Release 2.0)
- TSCDRV process (to be corrected for Release 2.0)
- Backup testing (to be confirmed by Release 2.0)
- On-line help (to be completed by May 29, 1996)

### 3 C-TIC SYSTEM TEST RESULTS

The following documents the test plan followed for the C-TIC, Release 1.0 system and the results of this procedure. The test plan used, Document #9937.01, is based primarily on the Requirements Specification Document #9933.03. The relevant section/item of the Requirement Specification Document is indicated by underline after each step in this test. The purpose of the system integration tests is to verify that the C-TIC software, hardware and user interface are functional and ready for operation. The test is composed of a series of steps. Each step was executed in sequence because some test steps rely on previous steps being completed. The tester initialed each step as it was completed. If the step completed successfully, then it was indicated as such in the test report. If the step fails, then a deficiency report was issued indicating the nature of the deficiency. When the deficiency was addressed, the item was re-tested and evaluated again.

Before starting the test, the C-TIC computer was on-line.

#### C-TIC SYSTEM TEST:

1. Log on to the C-TIC computer system. The system shall be capable of providing the versions of all C-TIC software. Verify that the software version numbers are available.  
Requirement(s): 2.9.1-10q

Tester: D. Weiss      Status: Pass

2. Verify from the C-TIC Subsystem Controller that all C-TIC related software processes are executing and that the status lights on the controller accurately reflect the status of all processes nested within.  
Requirement(s): 2.9.1-10u

Tester: D. Weiss      Status: Pass

Tests three through eight should be considered throughout the entire system testing period.

3. Verify that when the operator performs a function, that there is an indication that the input has been selected. The operator should not have to select a function twice. Requirement(s): 2.9.1-1

Tester: D. Weiss      Status: Deficient. The indication does not always appear during processes which take time to execute. This deficiency has been addressed and corrected.

Re-Tester: D. Weiss      Status: Pass

4. Verify that the operator interface is seamless to the operator when accessing the various subsystems, reports and statuses. Requirement(s): 2.9.1-10r

Tester: D. Weiss      Status: Pass

5. Verify that the operator interface presents the desired window/screen no later than 10 seconds after the request is made at least 95% of the time. Requirement(s): 2.9.1.4-1

Tester: M. Golucki      Status: Pass

6. Verify that all user commands and responses are in accepted traffic engineering or other non-specialist, non-cryptic terms. Requirement(s): 2.9.1-3  
Tester: D. Weiss      Status: Pass
7. Verify that online help is available for all features. Requirement(s): 2.9.1-4  
Tester: D. Weiss      Status: Deficient. The C-TIC User's Manual has not been completed and placed on-line. This deficiency is scheduled to be implemented by May 29, 1996.  
Re-Tester: \_\_\_\_\_      Status: \_\_\_\_\_
8. Verify that the graphical displays use color to the maximum extent possible. Requirement(s): 2.9.1-13  
Tester: D, Weiss      Status: Pass
9. The system shall be capable of providing access for the operator to view all log files associated with the processes listed in the Subsystem Controller. Verify that this capability exists by opening all log files. Inspect each logfile to verify that the system is capable of receiving data in real-time and that the data is correct. Requirement(s): 2.9.1-1, 2.9.1.2-1, 2.9.1-10d, 2.9.1-10g, 2.9.1-10j.  
Tester: D. Weiss      Status: Pass
10. Multi-tasking shall be provided. Verify that more than one program may be memory resident and executed concurrently within the machine under the management of the operating system. Requirement(s): 2.5-5  
Tester: D. Weiss      Status: Pass
11. Examine the Watchdog process logfile to verify that the process conducts monitoring and testing procedures at least once every minute. Requirement(s): 2.5-4  
Tester: D. Weiss      Status: Pass
12. The system shall be capable of providing access for the operator to view all status files associated with the processes listed in the Subsystem Controller. Verify that this capability exists by opening all status files. Requirement(s): 2.9.1-1, 2.9.1-10g  
Tester: D. Weiss      Status: Pass
13. The system shall be capable of providing access for the operator to reset all log files associated with the processes listed in the Subsystem Controller. Verify that this capability exists by resetting all the logfiles. Requirement(s): 2.9.1-1  
Tester: D. Weiss      Status: Pass
14. The system shall be capable of providing access for the operator to clear all errors associated with the processes listed in the Subsystem Controller. Verify that this capability exists by clearing any errors

associated with a single process when they exist. Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Deficient. The SSI processor turns back to magenta when the clear error is used. The problem was with a connection at SSI and has been remedied.

Re-Tester: D. Weiss Status: Pass

15. The system shall be capable of providing the operator with a means to view an error log containing system and process error information. This log shall also maintain a record of actions by the operator, system log, etc. Verify that all operator intervention activities are recorded in the error log by the system. As a minimum, the record shall indicate details of the data or commands input and the time initiated. Requirement(s): 2.9.1-1, 2.9.1-10g, 2.9.1-10j

Tester: M. Golucki Status: Pass

16. The system shall be capable of providing the operator with a means to halt the execution of each process individually. Verify that this capability exists by stopping the Watchdog and SSI Weather processes. Prior to stopping each process, the system should require verification from the operator to adequately protect against an accidental process shutdown due to operator error. Requirement(s): 2.9.1-1, 2.9.1-9

Tester: M. Golucki Status: Pass

17. The system shall be capable of providing the operator with a means to start the execution of each process individually. Verify that this capability exists by starting the Watchdog process only. Requirement(s): 2.9.1-1

Tester: D. Weiss Status: Pass

18. The primary function of the Watchdog process is to start a system process when the process fails to operate. Verify that the Watchdog process starts a process displaying an error after the errors are cleared. Requirement(s): 2.5-4

Tester: M. Golucki Status: Pass

19. The system shall be capable of providing the operator with a means to halt the execution of the entire system. Verify that this capability exists by stopping all of the processes with the shutdown button. Requirement(s): 2.9.1-1

Tester: D. Weiss Status: Pass

20. The system shall be capable of providing the operator with a means to start the entire system. Verify that this capability exists by starting all of the processes with the startup button. A complete system startup should take no more than one half hour. Requirement(s): 2.5-1, 2.6.4-3, 2.9.1-1

Tester: D. Weiss Status: Pass

21. The system shall be capable of providing the operator with a means to view the times when the last messages were sent and received at the C-TIC. Verify this with the last messages sent/received

button. Requirement(s): 2.9.1-1, 2.9.1-10g

Tester: D. Weiss      Status: Pass

22. The C-TIC shall be capable of displaying every outage/failure. Shut down the modem to the SSI weather subsystem. Verify that an audible alarm sounds and that an appropriate error message is displayed on the C-TIC operator terminal. Verify that the C-TIC system continues all other operations without any other disruptions. Requirement(s): 2.6.4-3, 2.6.4-5, 2.9.1-1, 2.9.1-10t

Tester: D. Weiss      Status: Pass

23. Verify that the above outage/failure is recorded on the appropriate C-TIC logfiles and restart the SSI weather subsystem modem. Verify that the SSI Weather subsystem is again operating properly. Requirement(s): 2.6.4-3, 2.9.1-1

Tester: D. Weiss      Status: Pass

24. Unusual system or equipment conditions such as CPU failure, unexpected CPU halt, memory failure, and disk failure shall be considered unrecoverable faults. Under these or similar conditions, verify that operation is automatically and safely terminated in an orderly manner, to the extent possible and is not automatically restarted unless all safety conditions are met. Verify that a shutdown occurs automatically due to a failed system test. Requirement(s): 2.5-2, 2.6.4-4

Tester: D. Weiss      Status: Pass

25. The system shall provide for a smooth transition and protect against the loss or damage of volatile memory in the case of an emergency or unplanned shutdown. Verify that volatile memory is protected following the shutdown in test 24. Restart the system and verify that full operation returns within 30 minutes. Requirement(s): 2.5-2

Tester: D. Weiss      Status: Pass

26. Verify that the system automatically supports daylight savings time (begins 4/7/96) and standard time, the number of days in a month, century changes and leap years. Requirement(s): 2.5-3

Tester: M. Golucki      Status: Pass

27. Verify that the system provides the operator with a graphical user interface with pull down menus. Requirement(s): 2.9.1-10c

Tester: M. Golucki      Status: Pass

The corridor map contains most of the functionality from the operator's perspective. Following are tests that are based on the user interface at the C-TIC.

28. Verify that on a single screen, the corridor map displays all roadways involved in the GCM Corridor that are included in the NavTech database. Requirement(s): 2.9.1-1, 2.9.1-10p, 2.9.1.1-1

Tester: M. Golucki      Status: Pass

29. Verify that the corridor map provides segment identifications, while in the select mode, by control-clicking on a particular segment. The resulting display should show the segment name, city and segment identification number. Requirement(s): 2.9.1-1, 2.9.1-14

Tester: M. Golucki      Status: Pass

30. There are to be two modes of the map; zoom and select. Verify that these exist and then enter the zoom mode and verify that the legend displays the mode that is selected. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

31. Verify that the zoom in/out functions work using the mouse or "hot keys" and at least ten (10) zoom levels exist. Requirement(s): 2.9.1-1, 2.9.1-10o

Tester: M. Golucki      Status: Pass

32. The operator should be able to scroll the map screen in a smooth manner. Scroll the map screen and verify that the map scrolls smoothly. Requirement(s): 2.9.1-1, 2.9.1.4-1

Tester: M. Golucki      Status: Deficient. The scrolling of the map does not operate in a smooth manner. This deficiency has been addressed to EECS.

Re-Tester: M. Golucki      Status: Pass

33. Verify that the select mode can be entered and that selecting a segment causes it to be highlighted on the map. Next, select an adjacent segment and verify that it too is highlighted. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

34. The C-TIC shall display information on the name of streets, city, county, and other information by selecting a node on the map. To select a node, zoom in on an intersection until the legend shows less than 0.1 KM. Then in select mode, select the center of the intersection with the left mouse button. This will highlight all adjacent segments and produce a yellow dot at the intersection. Now, choose the "Node Information" function on the right mouse button menu. Verify that the operator can display a menu with the right mouse button while in select mode or control-left click while in select mode. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

35. The operator shall be able to view the SIF file contents for a specified link. Select a link and then choose the "SIF File Contents" function on the right mouse button menu. Verify that the SIF file contents is displayed for the selected segment. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

36. Select a segment and then choose the "Loop Detector" function on the right mouse button menu. Verify that the loop detector data is displayed for the selected segment.

Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

37. The operator shall be able to exit this menu without invoking any of the other functions. Verify that by choosing the "Cancel" function on the right mouse button menu, the menu is closed.

Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

The tester shall select all roadways and then return to the zoom mode on the map. The next test will examine the "Monitor" function.

38. The operator shall have the capability to monitor loop detector data as it is entered into the system. Verify this through the "Monitor Loop Detector Data" function. Verify that the TSC data is being collected at one (1) minute intervals. Requirement(s): 2.9.1.2-1

Tester: M. Golucki      Status: Pass

The user shall use the "select clear" item to clear all highlighted road segments. The next series of tests will examine the "Display" functions.

39. The map shall be capable of displaying the road names or route numbers of the expressways. Verify this by invoking the "Road names" item. Requirement(s): 2.7.4-4 (Illinois only)

Tester: M. Golucki      Status: Deficient. The menu shows that this menu item is selected, but the road names do not appear on the map. This deficiency has been addressed and is in the process of being corrected.

Re-Tester: \_\_\_\_\_      Status: \_\_\_\_\_

40. Verify that all loop detectors providing data to the C-TIC can be displayed via the "Loop detectors" menu item. Requirement(s): 2.9.1-1, 2.9.1-14

Tester: M. Golucki      Status: Pass

41. Verify that the map legend and scale can be displayed via the "Legend and Scale" menu item and "hot" keys.

Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

42. Verify that a level 0 map can be displayed via the "Level 0" menu item. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

43. Verify that a level 1 map can be displayed via the "Level 1" menu item. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

44. Verify that a level 2 map can be displayed via the "Level 2" menu item. Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Pass

45. Verify that a level 3 map can be displayed via the "Level 3" menu item. Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Pass

The next series of tests will examine the "Select" function.

46. Verify that by selecting the "Select All" function, the entire map becomes highlighted. After verification, use the "Select Clear" function. Verify that the map now displays the normal colors.

Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Pass

47. By selecting the "Select Segment" function, a prompt appears for a segment ID. Enter a valid segment ID and click on the OK button. Verify that the proper segment has been highlighted on the map. After verification, use the "Select Clear" function.

Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Deficient. Some segment ID's are not found in the database. This deficiency was submitted to EECS and corrected.

Re-Tester: D. Weiss Status: Pass

48. By selecting the "Select Road" function, a window appears for selecting the road. Enter various combinations of cross streets, towns, etc. Verify that the proper road segments have been highlighted on the map for each case. After verification, use the "Select Clear" function.

Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Pass

49. By selecting the "Select Intersection" function, a window appears for selecting the intersection. Enter a valid intersection and click on the OK button. Verify that the proper segments have been highlighted on the map. After verification, use the "Select Clear" function. Repeat this test for several valid intersections. Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Pass

The next series of tests will examine the "Locate" function.

50. Select any segment in the test area and then zoom in on a section of the map that does not include the selected segment. Verify that by selecting the "Locate Selection" function, the highlighted segment is displayed in the center of the map display. Requirement(s): 2.9.1-1

Tester: M. Golucki Status: Pass

51. Verify that by selecting the "Locate Segment" function, a window is displayed for the operator to input a segment ID. Next, verify that by inputting a valid segment ID and then clicking on the OK

button causes the chosen segment to be displayed in the center of the map display. Repeat this test for various segment IDs. Verify that invalid segment IDs are not located by this function.

Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Deficient. Some Segment ID's are not found in the database. This deficiency has been submitted and corrected by EECS.

Re-Tester: D. Weiss      Status: Pass

52. Verify that by selecting the "Locate Intersection" function, a window is displayed for the operator to input an intersection. Next, verify that by inputting a valid intersection and then clicking on the OK button causes the chosen intersection to be displayed in the center of the map display. Repeat this test for various valid intersections. Verify that invalid intersections are not located by this function. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

53. Verify that by selecting the "Locate Road" function, a window appears for selecting the road. Enter various combinations of cross streets, towns, etc. Verify that the proper road segments have been centered on the map for each case. Verify that invalid road segments are not located by this function. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

54. Verify that by selecting the "Locate Loop Detector" function, a window is displayed for the operator to input a loop detector ID. Next, verify that by inputting a valid loop detector ID and then clicking on the OK button causes the chosen loop detector to be displayed in the center of the map display. Repeat this test for several valid detector IDs. Verify that invalid detector IDs are not located by this function. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

55. Verify that by selecting the "Locate Lat/Long" function, a window is displayed for the operator to input a Lat/Long position. Next, verify that inputting a valid Lat/Long position and then clicking on the OK button causes the chosen Lat/Long to be displayed in the center of the map display. Repeat this test for several valid Lat/Long positions. Verify that invalid Lat/Long positions are not located by this function. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

The next series of steps will examine the "View" functions.

56. Verify that by selecting the "Create New" function, a new corridor map is displayed. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

57. Verify that by selecting the "Close" function, the current map window is closed properly. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

The next series of steps will examine the "Input" functions.

58. The operator shall be able to change map properties. Verify this by selecting the "Map Properties" function. Verify that the colors for each rank (0 through 3) can be changed. Display the level 3 map and verify the correct color for rank 3. Change the level of the display back to level 1 and verify that the new colors are displayed. Requirement(s): 2.9.1-1, 2.9.1-14

Tester: M. Golucki      Status: Pass

The next series of tests will examine the functions located in the "CTIC Programs Menu" window. This window is opened by locating the cursor in the background area of the display (not in any window) and then clicking on the right mouse button.

Verify that all Legato backup functions are operating properly. Verify that the following Legato "backup" and "recover" functions are available from the "Backup Utilities Legato" menu.

59. Verify that the backup utility is able to perform the following:  
Requirement(s): 2.8.3-4, 2.8.3-5, 2.8.3-8
- store data on a computer readable removable media
  - perform operations while the system is online
  - formatting/reformatting tapes
  - list contents of tape, total space available on tape, and remaining space available on tape
  - prompting for additional media as necessary

Tester: D. Weiss      Status: Pass

60. Verify that the system is able to perform operator initiated backup of data from active to backup system and restoration of data from backup to active.  
Requirement(s): 2.8.3-6, 2.8.3-7, 2.9.1-1, 2.9.1-23

Tester: D. Weiss      Status: Pass

61. Verify that when the system is in full operating mode, the backup utility has no significant, sustained impact on the operation of the C-TIC. Requirement(s): 2.8.4-1, 2.9.1-10b

Tester: D. Weiss      Status: Pass

62. Verify that the system is capable of performing a backup of the database and that a full database backup requires no longer than 60 minutes when the system is online.  
Requirement(s): 2.8.4-2, 2.9.1-10b, 2.8.3-1

Tester: D. Weiss      Status: Pass

63. Verify that a daily incremental database backup requires no longer than 30 minutes when the system is online. Requirement(s): 2.8.4-3

Tester: D. Weiss      Status: Pass

64. Verify that the system is capable of performing a backup of each disk drive independently.  
Requirement(s): 2.8.3-2
- Tester: D. Weiss      Status: Pass
65. Verify that the Legato Archive function has a tape verification process which checks the contents of the file on disk against the contents of the file on tape. Requirement(s): 2.8.3-3
- Tester: M. Golucki      Status: Pass
66. Verify that the system is able to backup and recover individual files. Requirement(s): 2.8.3-9
- Tester: D. Weiss      Status: Pass
67. Verify that the Legato Administrator functions are available from the “Backup Utilities Legato Administrator” menu item. Requirement(s): 2.9.1-1
- Tester: M. Golucki      Status: Pass
68. Verify that the “Backup Utilities Eject Tape” function properly ejects a tape.  
Requirement(s): 2.9.1-1
- Tester: D. Weiss      Status: Pass
69. Verify that the Log file manager is available from the “Backup Utilities Log file manager” menu item.  
Requirement(s): 2.9.1-1
- Tester: D. Weiss      Status: Pass
70. Verify that the operator can display a clock from the “Misc.” menu. Requirement(s): 2.9.1-1
- Tester: M. Golucki      Status: Pass
71. Verify that the operator can display the performance meter from the “Misc.” menu.  
Requirement(s): 2.9.1-1
- Tester: M. Golucki      Status: Pass
72. Verify that the operator can monitor printing status and print a file through the "Print Tool" function located on the “Misc.” menu. Requirement(s): 2.9.1-1
- Tester: M. Golucki      Status: Pass
73. Verify that the operator can access the Snapshot utility from the “Misc.” menu.
- Tester: M. Golucki      Status: Pass
74. Verify that the operator can access the Text Editor from the “Misc.” menu. Verify that editor software exists to adequately support the input, modification, display, listing and storage onto disk and tape files, of assembly language source code, C/C++ source codes and data for eventual use by

programs written in any of the proposed language(s). Requirement(s): 2.10.2-3

Tester: D. Weiss      Status: Pass

75. The operator shall be able to produce standard reports. Verify that the system produces three standard types of reports (Loop Detector Summary, Process Status Report and Performance Report) and that the system can direct the output of these standard reports to a file or printer. Verify that the "Reports Disk Usage" function is operating properly and that the output can be sent to a file, screen and printer. Verify that the "Reports Files on tape" function is operating properly and that the output is sent to a file and printer.

Requirement(s): 2.9.1-1, 2.9.1-19, 2.9.1-20, 2.9.1-17

Tester: M. Golucki      Status: Deficient. There is no option to print Standard Reports and the Disk Usage Report only prints to the printer. There is no indication that the report can be viewed on the screen without having to print the report.

Re-Tester: D. Weiss      Status: Pass

76. Verify that the system begins printing a standard report (Loop Detector Summary, Process Status Report or Performance Report) no later than 30 seconds after the request to print is made assuming an empty queue. If the printer is busy at the time of the request, verify that the report is queued such that it can be presented at the earliest opportunity the device is free.

Requirement(s): 2.9.1-21, 2.9.1.4-1

Tester: M. Golucki      Status: Deficient. There are no Standard Reports in the printing menu.

Re-Tester: D. Weiss      Status: Pass

77. Verify that the operator has the capability to create/delete accounts on the C-TIC through the "Account Editor" function. Requirement(s): 2.9.1-1, 2.9.1-10q

Tester: M. Golucki      Status: Pass

78. Verify that the operator can invoke an additional C-TIC Subsystem Controller via the "Process Controller" menu item. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

79. Verify that the operator is able to view the current users through the "Current Users" function. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

80. Verify that the operator can display the IDOT-TSC Detailed Expressway Congestion Map on the Internet through the "Expressway Map" function. Requirement(s): 2.9.1-1, 2.9.1.1-1

Tester: M. Golucki      Status: Pass

81. Verify that the Illinois data contained within the Expressway Congestion Map is current and

automatically updated once per minute within the C-TIC. In the browser, reload the map once per minute for 3 minutes to check that the Illinois data is updated on the map.

Requirement(s): 2.7.4-11

Tester: M. Golucki      Status: Pass

82. Verify that the Illinois data contained within the "small" Congestion Map is current and automatically updated once per minute within the C-TIC. In the browser, reload the map once per minute for 3 minutes to check that the data is being updated. Requirement(s): 2.7.4-11

Tester: M. Golucki      Status: Deficient. The expressway name for I-90, the Kennedy Expressway, does not appear on the map. This name is needed to click on to obtain loop detector speeds along this roadway.

Re-Tester: D. Weiss      Status: Pass

83. Verify that the operator can display congestion data for instrumented/detectorized roadways of strategic/national significance in the Illinois portion of the corridor graphically in the form of color coded segments on the Expressway Congestion Map.

Requirement(s): 2.7.4-5, 2.9.1-10d, 2.9.1-14

Tester: M. Golucki      Status: Pass

84. Verify that Interstates in the Illinois portion of the corridor are identified on the Expressway Congestion Map by their interstate route number. Requirement(s): 2.7.4-4

Tester: M. Golucki      Status: Pass

85. Verify that the operator can display speed data at each loop detector on the Kennedy Expressway by selecting on the word "Kennedy" on the Expressway Congestion Map. Repeat this test for other expressways in the Illinois section of the corridor. Requirement(s): 2.7.4-7

Tester: M. Golucki      Status: Pass

86. Return to the Expressway Congestion Map and verify that the operator can display the travel times between major interchanges in the Illinois portion of the corridor. Requirement(s): 2.7.4-8

Tester: M. Golucki      Status: Pass

Exit the browser and return to the "CTIC Programs Menu".

87. The C-TIC shall be capable of receiving input data from NWCD. Verify that this data is available from the "NWCD Incident Summary" menu item. Verify that the data is correct.

Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

88. Verify that the operator can display an additional Corridor map through the "Corridor Map" function. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

89. Verify that the Netscape World Wide Web Browser can be accessed from the "WWW Browser" function. Verify that the GCM Homepage is accessible through this browser.  
Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

90. Verify that the GCM Homepage is available 24 hrs./day, 7 days/week, 99% of the available runtime, for the life of the project. Requirement(s); 2.7.4-2

Tester: M. Golucki      Status: Pass

91. Verify that the GCM Homepage provides a map of the Illinois portion of the corridor.  
Requirement(s): 2.7.4-4

Tester: M. Golucki      Status: Pass

92. In order to verify that the operator can save the display layout via the "Save Windows" function, rearrange the windows on the display screen (i.e., place the subsystem controller on the left side of the display). Invoke the "Save Windows" function and verify that the new window layout is presented at test 94. Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

93. Verify that the operator is able to exit the system through the "Logout" function  
Requirement(s): 2.9.1-1

Tester: M. Golucki      Status: Pass

Log back in and complete the tests. The next series of tests are general tests to provide for areas not covered in the previous tests relating to the specific windows and menu items.

94. The C-TIC shall be capable of handling multiple operators. Logon to the second operator terminal and verify that a database access on a node can be performed at the same time on both X-terminals. Verify that the operator interface informs the operator if a particular area of the user interface is in use (e.g., if two operators attempt to change the same parameter in the system.) It shall be possible, however, to perform simultaneous "reads" of identical items.  
Requirement(s): 2.9.1-6, 2.9.1-10s

Tester: D. Weiss/M. Golucki      Status: Pass

95. Verify that at least eight windows can be open concurrently with minimal degradation in system performance. Requirement(s): 2.9.1-11

Tester: M. Golucki      Status: Pass

96. Verify that system room temperature is between 70°F and 80°F and non-condensing relative humidity is between 20% and 70%. Requirement(s): 2.6.4-6

Tester: D. Weiss      Status: Pass

Tests 97 and 98 require interruption of the normal power supply to the C-TIC. Necessary precautions should be taken to ensure that adverse effects to other operations at the C-TIC and Project Office are minimized.

97. Verify that system continues to operate via the UPS system if power fails at the Project Office.  
Requirement(s): 2.6.4-7, 2.6.4-8

Tester: D. Weiss/C. Solberg/M. Golucki      Status: Pass

98. Verify that the system restarts automatically within 30 minutes following a complete power failure. This powerfail restart should require no operator intervention.  
Requirement(s): 2.5-1, 2.6.4-8

Tester: D. Weiss/C. Solberg/M. Golucki      Status: Pass

99. Verify that system hardware provides the following items:  
Requirement(s): 2.6.1.1-1, 2.6.1.1-2, 2.6.1.2-1, 2.6.2-1, 2.7.2-2

- at least 13.6 GB of disk storage with the ability to store data at the following rates:
  - Detector Data    360 MB/week
  - ETTM data        40 MB/week
- off-line storage capacity of at least 5.0 GB on magnetic tape
- server RAM between 256 MB and 512 MB
- each line and associated hardware capable of handling information at a rate of at least 14.4 kbps

Tester: D. Weiss      Status: Pass

100. Verify that the C-TIC utilizes existing memory up to the point where additional memory is essential for operation. Requirement(s): 2.6.2-2

Tester: D. Weiss      Status: Pass

101. Verify that the system contains components (processors) that are scalable and capable of handling a heavy processing load. Verify that the C-TIC is capable of handling multiple users simultaneously along with the processing of incoming data and outgoing information. Requirement(s): 2.6.3-1

Tester: D. Weiss      Status: Pass

102. Verify that the C-TIC is portable to other similar hardware platforms and scalable in terms of I/O connections, processes and user interface features. Requirement(s): 2.6.3-2

Tester: D. Weiss      Status: Pass

103. Verify that the C-TIC utilizes existing hardware components up to the point where additional components are essential for operation. Requirement(s): 2.6.3-3

Tester: D. Weiss      Status: Pass

104. Verify that the system takes into account the impact of major problems with a low probability of

occurrence. Requirement(s): 2.6.4-2

Tester: D. Weiss      Status: Pass

105. Verify that the system is capable of supporting up to 60 external data interfaces. The external interfaces shall be able to support text based data transmission (fax or teletype), interactive text-based workstations and interactive graphical workstations.

Requirement(s): 2.7.1-1, 2.7.2-1

Tester: D. Weiss      Status: Pass

106. Verify that the system is capable of receiving information from all external data interfaces and transmitting all text and graphical information to all external agencies with no frequent continual noticeable loss of system performance (speed, reliability). Requirement(s): 2.7.3-1, 2.7.3-2

Tester: D. Weiss      Status: Pass

107. Verify that the archive system has the ability to perform daily purging of data from the database.

Requirement(s): 2.8.2-8

Tester: D. Weiss      Status: Pass

108. Verify the database incorporates location independent access to data and that data items are automatically assigned unique identifiers which are independent of the data's physical location.

Requirement(s): 2.8.1.2-2

Tester: D. Weiss      Status: Pass

109. Verify that the database is capable of storing up to 281 tera-objects with each object of unlimited size.

Requirement(s): 2.8.1.3-1

Tester: D. Weiss      Status: Pass

110. Verify that the database has the ability to group operations such as data reads and writes to minimize communication overhead. Requirement(s): 2.8.1.3-3

Tester: D. Weiss      Status: Pass

111. Verify that the database is ODBC compliant, supports SQL based queries and is capable of interfacing with C and C++ applications. Requirement(s): 2.8.1.6-1, 2.8.1.6-2, 2.8.1.7-1

Tester: D. Weiss      Status: Pass

112. Verify that the system uses a mutually acceptable version of the Versant object oriented database, a standard off-the-shelf database software package. Requirement(s): 2.8.1.1-1, 2.8.1.1-2

Tester: D. Weiss      Status: Pass

113. Verify that the system is able to perform simple queries on the database.

Requirement(s): 2.8.1.1-4

Tester: M. Golucki      Status: Pass

114. Verify that the database supports platform heterogeneity in that it performs transparent management of data across different computing platforms. Requirement(s): 2.8.1.2-1

Tester: D. Weiss      Status: Pass

115. The database shall support data migration. Verify that the database is able to store and transparently migrate data across computers. Requirement(s): 2.8.1.2-3

Tester: D. Weiss      Status: Pass

116. Verify that the server supports queries and forwards responses to the client. Requirement(s): 2.8.1.3-2

Tester: D. Weiss      Status: Pass

117. The database shall maintain accuracy control. Verify that the database is able to update objects and fail at the end of a transaction if a conflict occurs and to lock data to prevent inconsistent views of the data. Requirement(s): 2.8.1.3-4, 2.8.1.4-1

Tester: D. Weiss      Status: Pass

118. The database shall be able of performing serialized transactions. Verify that the result of concurrent operations is consistent with a serialized sequence of those same operations. Requirement(s): 2.8.1.4-2

Tester: D. Weiss      Status: Pass

119. Verify that database transactions are not allowed to partially commit. Requirement(s): 2.8.1.4-3

Tester: D. Weiss      Status: Pass

120. Verify that the database is able to mirror a database and automatically switch to the backup. Failover shall be transparent and allow transactions to continue uninterrupted. Requirement(s): 2.8.1.4-4

Tester: D. Weiss      Status: Pass

121. The system shall provide for online space reclamation and reuse. Verify that data which is no longer needed is automatically reclaimed by the database and its memory location reused for subsequent data storage. Requirement(s): 2.8.1.5-1

Tester: D. Weiss      Status: Pass

122. The system shall provide for the online addition of volumes. Verify the ability to add storage to the database without interruption of transactions. Requirement(s): 2.8.1.5-2

Tester: D. Weiss      Status: Pass

123. Verify that all system users in the C-TIC are able to list and/or print all system database and monitoring information. Requirement(s): 2.9.1-10i

Tester: D. Weiss      Status: Pass

124. The system shall automatically generate a unique message for each system error condition. All messages shall indicate the date and time of the occurrence as well as complete descriptive information for each specific message. Requirements(s) 2.9.1-16

Tester: D. Weiss      Status: Pass

125. Verify that the operator interface provides: statistical information on C-TIC operations and is able to run simple queries, reports on current data processing, operations reports, and status reports. Requirement(s): 2.9.1-10l

Tester: M. Golucki      Status: Pass

126. Verify that the application software is based on high level, state-of-the-art programming languages (C or C++.) The operating system software shall include a high level language compiler capable of handling the proposed source code used in the preparation of the application software. Where portions of the proposed application software package have been written in assembler code, an assembler shall be provided. Requirement(s): 2.10-1

Tester: D. Weiss      Status: Pass

127. The system shall utilize UNIX as the operating system. Verify that the maintenance and diagnostic software permit the operator to test processor and memory functions and the peripheral equipment supplied. Verify that the software provides the capability of identifying the existence, location and type of malfunctions, and checks all phases of system operation. As a minimum, these tests include individual tests of the following:

Requirement(s): 2.10.1-1, 2.10.2-1

- memory access, tested by reading and writing entire memory
- individual registers
- instruction execution
- interrupt and trap response
- I/O transfers, including all peripheral equipment
- all digital input/output equipment furnished.

Tester: D. Weiss      Status: Pass

128. Verify that third party off-the-shelf software or UIC-EECS utility software perform the following functions: Requirement(s): 2.10.2-2

- display and make modifications to any field in the database
- rename disk files and assign named files and devices for input/output during program execution from a file manager
- save, restore and otherwise manipulate programs from devices or files
- selectively transfer any user designated information between any two applicable devices in the system (e.g., tape to disk and vice versa)

- provide disk file functions including creation and deletion of files, copying of files and a directory of all fields including size and location of each

Tester: D. Weiss      Status: Pass

129. The hardware/software acceptance test for the system will consist of a 30 day test. Verify that the system hardware and system software does not require maintenance more than once and that it is available for operation 99% of the total available runtime over the course of the 30 days. In the instance of a total system failure, verify that MTTR for the system as a whole is not more than 8 hours. Verify that the system provides for minimum shutdown time during periods of maintenance or repair. Requirement(s): 2.6.4-1, 2.6.4-3, 2.10-2

Tester: M. Golucki      Status: Pass.